National German, European and International Activities on Assessment of the Energy Performance of Public Buildings

Workshop: Energy Efficiency in Government Building Retrofit

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Overview

- EU Energy Performance Building Directive (EPBD)
  - what is required
- German implementation of the EPBD: DIN V 18599
  - short overview
- Related projects:
  - International:
    - IEA ECBCS Annex 36: Retrofitting of Educational Buildings
    - REDUCE
  - European:
    - EU 6th Framework Programme Integrated Project: Bringing Retrofit Innovation to Application in Public Buildings – BRITA in PuBs
    - EU EIE Programme: EPA-NR, ENPER-EXIST
    - EU Concerted Actions
  - German:
    - Field study on certification of dwellings
    - First certifications of non-residential buildings
    - Innovation offensive of the German chancellor: Innovation idea „Energy-efficient retrofit of schools“

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EU Energy Performance Building Directive (EPBD)

- entered into force: 1/1/2003

- must be transfered to national law until 1/1/2006

- requirements for all member states:

  A) methodology for the calculation of energy performance: holistic approach including building envelope, HVAC systems, lighting, fuel type, renewable energy

  B) application of minimum requirements of the energy performance for new buildings and major renovations

  C) certifications on the energy performance of new buildings and of existing buildings in the case of owner changes, leasing, and inheritance. Public buildings are asked to indicate their energy performance at an apparent place

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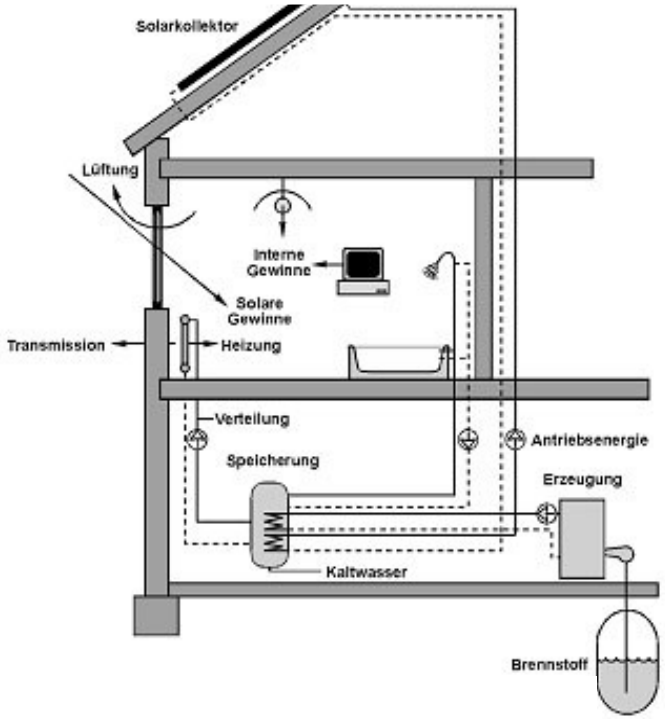
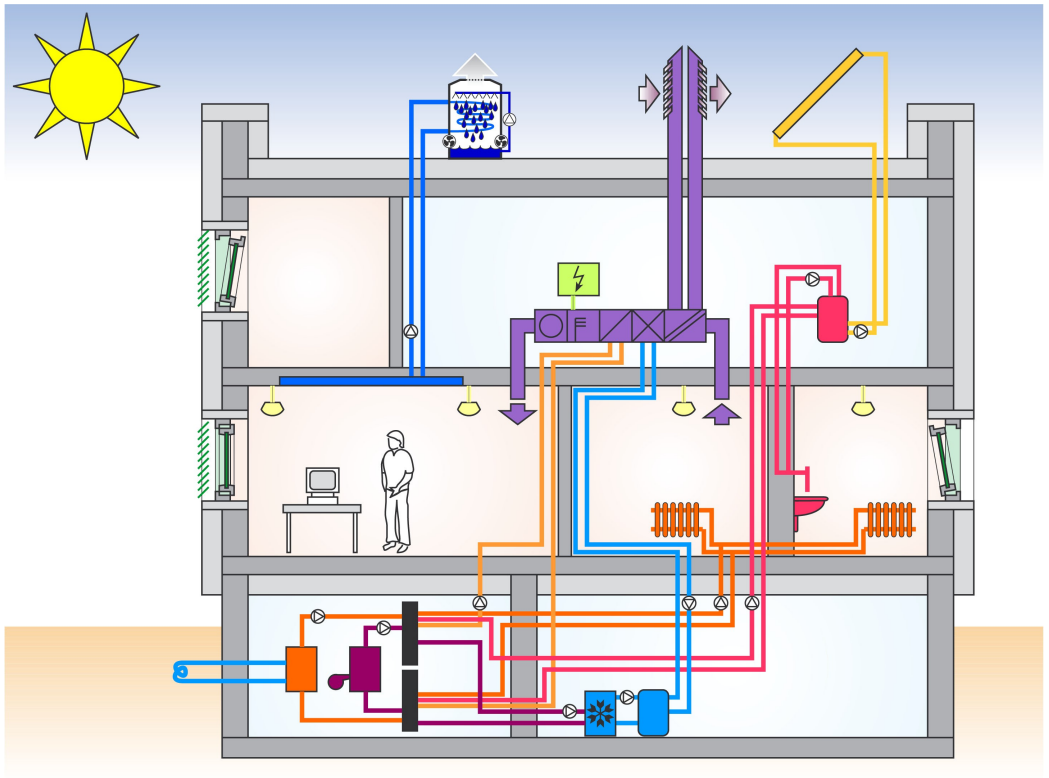
German Implementation of the EPBD: DIN V 18599

Former Energy Balance (EnEV)



-> certification for new and existing residential buildings

New Energy Balance



-> certification for new and existing non-residential buildings

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German Implementation of the EPBD: DIN V 18599

Part 1: General
- Definitions
- Balance method
- Zoning
- Primary energy factors
- Influences to the environment

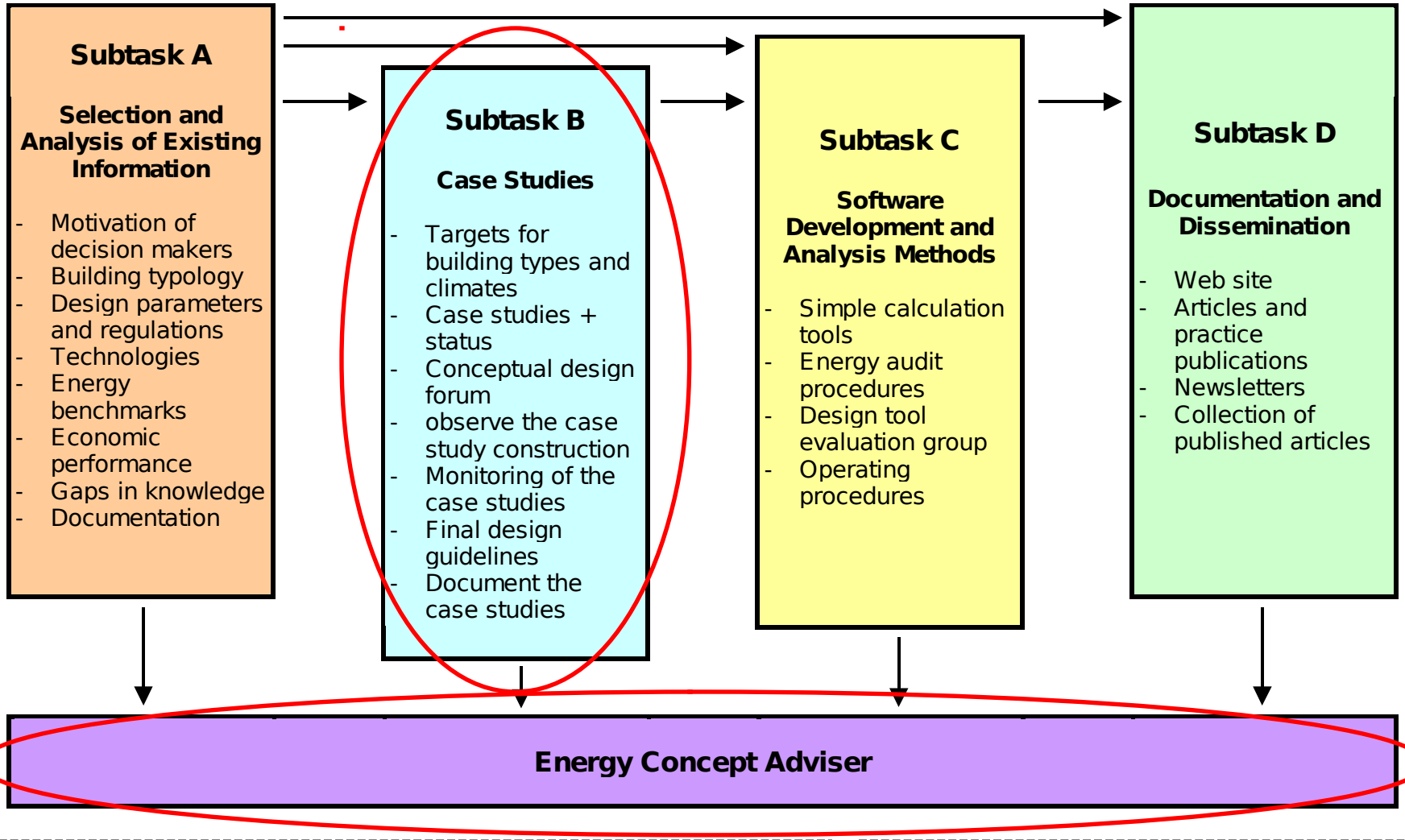
- **Part 2: Net energy for Room heating and cooling**
- **Part 3: Net energy demand for Air-conditioning**
- **Part 4: Final energy for Lighting**
- **Part 5: Final energy for Heating**
- **Part 6: Final energy for Ventilation systems of dwellings**
- **Part 7: Final energy for Air-conditioning + Cooling**
- **Part 8: Final energy for Domestic hot water**
- **Part 9: Final energy for Multifunctional generators**
- **Part 10: Boundary conditions**
- **Part 11: Examples**
- **Part 12: Energy certification procedure**

IEA ECBCS ANNEX 36:

Retrofitting in Educational Buildings – REDUCE

Energy Concept Adviser for Technical Retrofit Measures

IEA ECBCS Annex 36



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Annex 36: 25 Case Studies from 10 Countries

View	country	case study
	Germany	D1: Exemplary Retrofitting of a school in Stuttgart (EROS) D2: Bertolt-Brecht-School in Dresden D3: Paul-Robeson-School in Leipzig D4: University of Stuttgart D5: University of Ulm
	Denmark	DK1: Egebjerg School, Ballerup DK2: Enghøjskolen, Hvidovre DK3: Vridsløselille School, Albertslund
	Finland	SF1: Elementary School of Oulujoki SF2: Vihasitenkari Day Care Centre
	France	FR1: Louise Labe secondary school FR2: Gambetta professional high school

View	country	case study
	Greece	GR1: Chemical Engineering building NTUA, Athens GR2: University of Ionnina
	Norway	N1: Kampen School
	Poland	PL1: Secondary School Swarzedz PL2: Poznan University of Technology
 	UK	UK1: William Parker Community Secondary School UK2: Hadley Junior School UK3: Grove House Refurbishment UK4: George Tomlinson School, Bolton, Lancashire UK5: Ketley Town Junior School
	USA	US1: Wausau West High School, Sullivan County, TN US2: University of New Hampshire

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Annex 36: Energy Technologies by Case Study Overview

Energy technologies		Total
Building envelope	Windows	15
	Insulation materials & systems	13
	Over-cladding systems	1
	Doors	6
Heating systems	Heating installations	8
	Domestic hot water installations	5
	Energy sources	11
	Control systems	14
Ventilation systems	Natural ventilation systems	10
	Mechanical ventilation systems	8
	Hybrid ventilation systems	7
	Control & information systems	12
Solar control & cooling	Shading & glare protections	8
	Cooling systems	5
	Air-conditioning systems	3
	control systems	5
Light & electrical appliances	Lighting systems	11
	Electrical appliances	7
	Daylight technologies	8
	Control systems	10
Management	Energy audit techniques	6
	Commissioning	1
	Education & training	2
	Non-investment measures	2

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Annex 36: Case study project aims

Project aims can be divided into 3 main groups:

- holistic approach with several implemented energy saving technologies, high energy savings and less focus on short payback times
- cost-effective approach with fewer technologies and smaller savings
- focus on existing problems like indoor comfort, air-quality, lighting comfort. Energy savings as a positive side effect

Energy savings:

- as high as 75 % heating (German and Danish projects with 200-280 kWh/m²a before and 50-90 kWh/m²a after the retrofit) and 100 % electricity (Greek case study with PV-panels)
- UK and US projects with rather modest savings (8-20 % heating and 15 % electricity) but short paybacks

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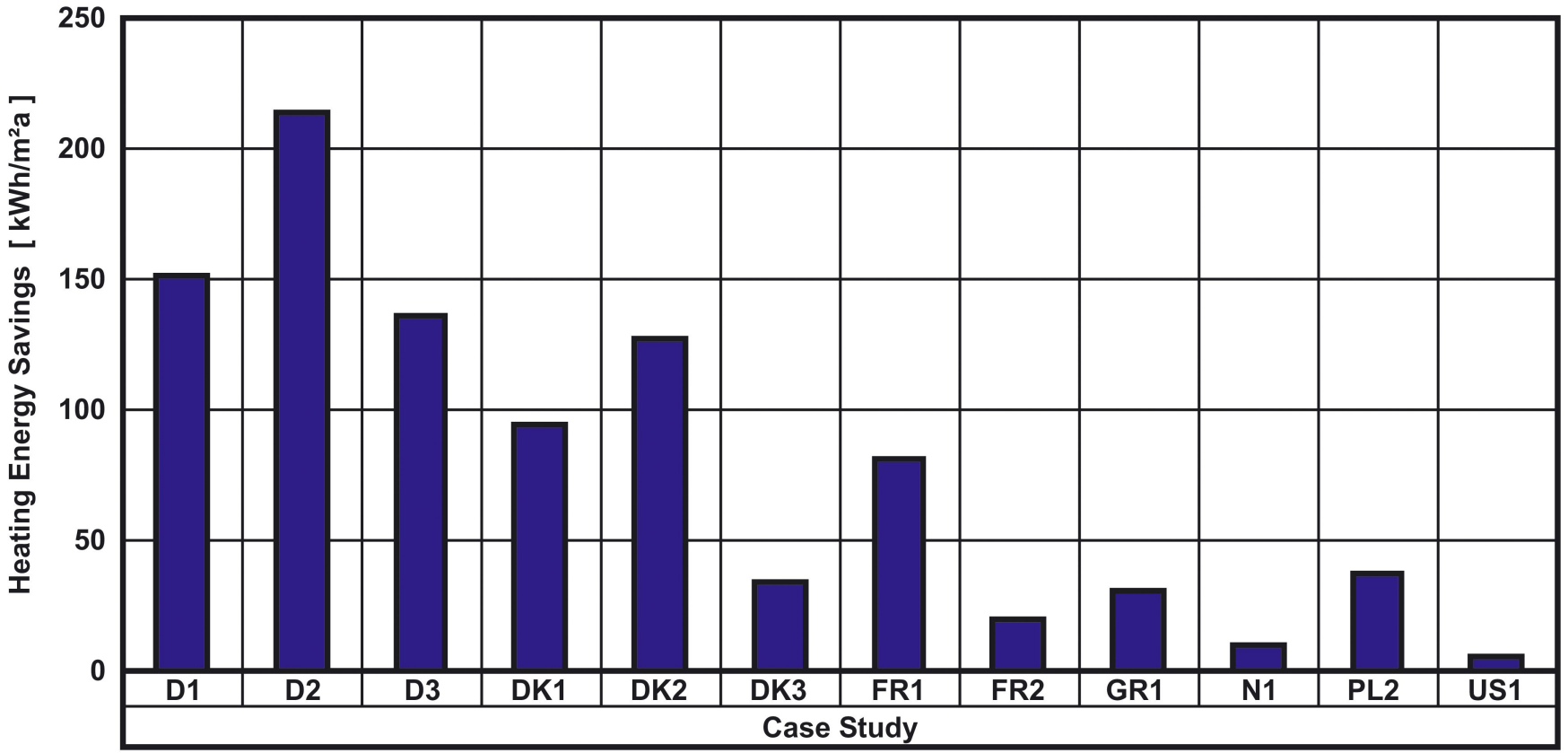
Annex 36: Energy savings

Heating Energy Savings



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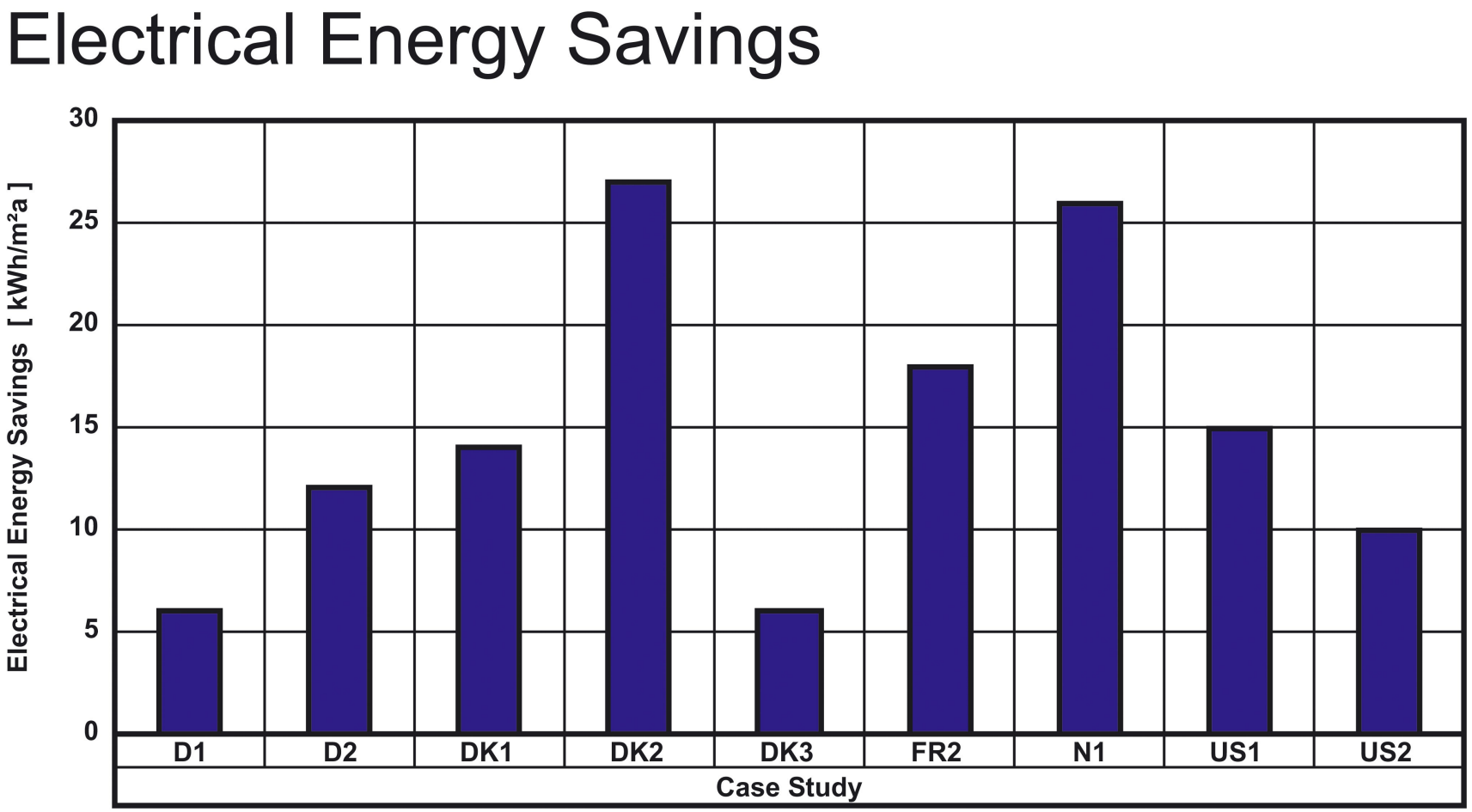
Annex 36: Energy savings



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Annex 36: Ventilation strategies

Different countries follow different ventilation strategies in the school projects:

	Finland	Focus on indoor air quality, mechanical ventilation with heat recovery
	Norway Denmark	Tendency to remove mechanical ventilation and replace it with natural hybrid ventilation, supported by fans if necessary
	Germany	- natural ventilation by opening the windows, can be supported by an indoor air quality visualisation - natural ventilation with pre-heating/pre-cooling by atria - natural ventilation through shafts into the classrooms and from there to corridors, supported by fans
	France	- minimum air-change rate provided by a mechanical ventilation system - natural ventilation by opening the windows
	Poland	Ventilation by opening the windows
	UK	Retrofit projects dealt not with ventilation strategies, but schools are mainly ventilated by opening the windows with sometimes mechanical ventilation by fans or draft support
	US	Ventilation through the windows, in one case additional mechanical ventilation system with heat recovery

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Annex 36: Lessons learned regarding ventilation

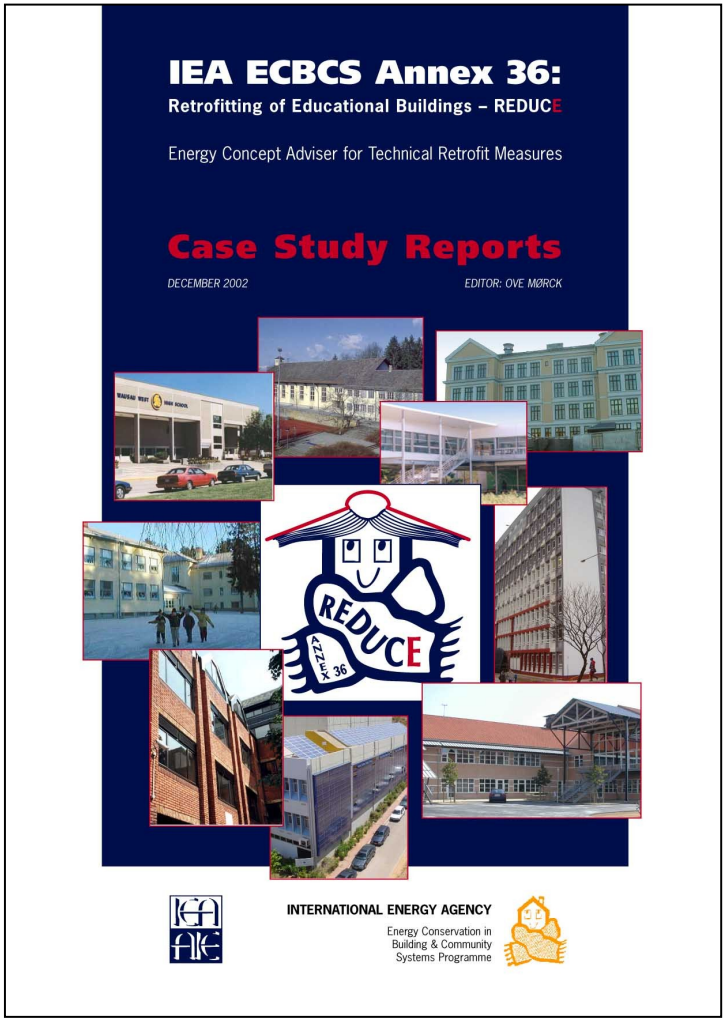
- natural ventilation by opening the windows can be efficient, but may need support by simple IAQ visual indication
- due to the high acceptance of atria they should not be intended to be preheating zones
- night-ventilation strategy combined with efficient shading strategy leads to comfortable summer conditions
- earth duct pre-heating and pre-cooling can be quite effective for natural (or hybrid) ventilation systems. Costs must be considered carefully
- innovative ventilation systems including continuous air intakes have to be planned carefully to avoid uncomfortable cold air streams. Otherwise the users will shut down the system and will keep opening the windows as before
- the use of crawlspaces for the inlet ventilation air has proven to be useful in one of the case studies; it eliminates the need for preheating the ventilation air before it enters the classroom. The floor insulation against the crawl space has to be designed properly
- care should be taken when placing earth ducts. Avoid placing them near drainage layers as this might cause problems with water in the ducts during high ground water level
- the control of natural hybrid ventilation systems by presence sensors and time-clock control is cheaper and more reliable than the use of CO_2-sensors
- in schools, good indoor air quality and high energy economy of schools can be guaranteed only by the use of mechanical supply and exhaust ventilation with

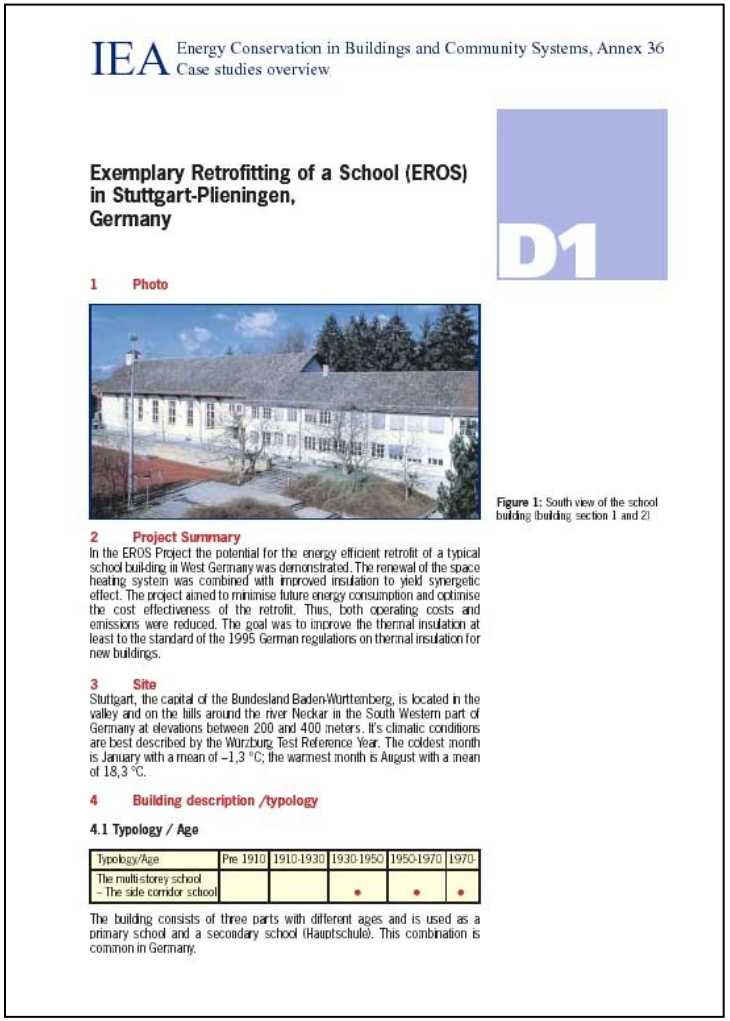
IEA ECBCS ANNEX 36:

Retrofitting in Educational Buildings – REDUCE

Energy Concept Adviser for Technical Retrofit Measures

Annex 36: Case Study


IEA ECBCS Annex 36:
Retrofitting of Educational Buildings – REDUCE
Energy Concept Adviser for Technical Retrofit Measures
Case Study Reports
DECEMBER 2002
EDITOR: OVE MØRCK
INTERNATIONAL ENERGY AGENCY
Energy Conservation in Building & Community Systems Programme



IEA Energy Conservation in Buildings and Community Systems, Annex 36
Case studies overview

Exemplary Retrofitting of a School (EROS) in Stuttgart-Plieningen, Germany

D1

1 Photo

Figure 1: South view of the school building (building section 1 and 2)

2 Project Summary

In the EROS Project the potential for the energy efficient retrofit of a typical school building in West Germany was demonstrated. The renewal of the space heating system was combined with improved insulation to yield synergetic effect. The project aimed to minimise future energy consumption and optimise the cost effectiveness of the retrofit. Thus, both operating costs and emissions were reduced. The goal was to improve the thermal insulation at least to the standard of the 1995 German regulations on thermal insulation for new buildings.

3 Site

Stuttgart, the capital of the Bundesland Baden-Württemberg, is located in the valley and on the hills around the river Neckar in the South Western part of Germany at elevations between 200 and 400 meters. It's climatic conditions are best described by the Würzburg Test Reference Year. The coldest month is January with a mean of –1,3 °C; the warmest month is August with a mean of 18,3 °C.

4 Building description /typology

4.1 Typology / Age

Typology/Age	Pre 1910	1910-1930	1930-1950	1950-1970	1970-
The multi-storey school – The side corridor school			•	•	•

The building consists of three parts with different ages and is used as a primary school and a secondary school (Hauptschule). This combination is common in Germany.

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Annex 36: Energy Concept Adviser (ECA)

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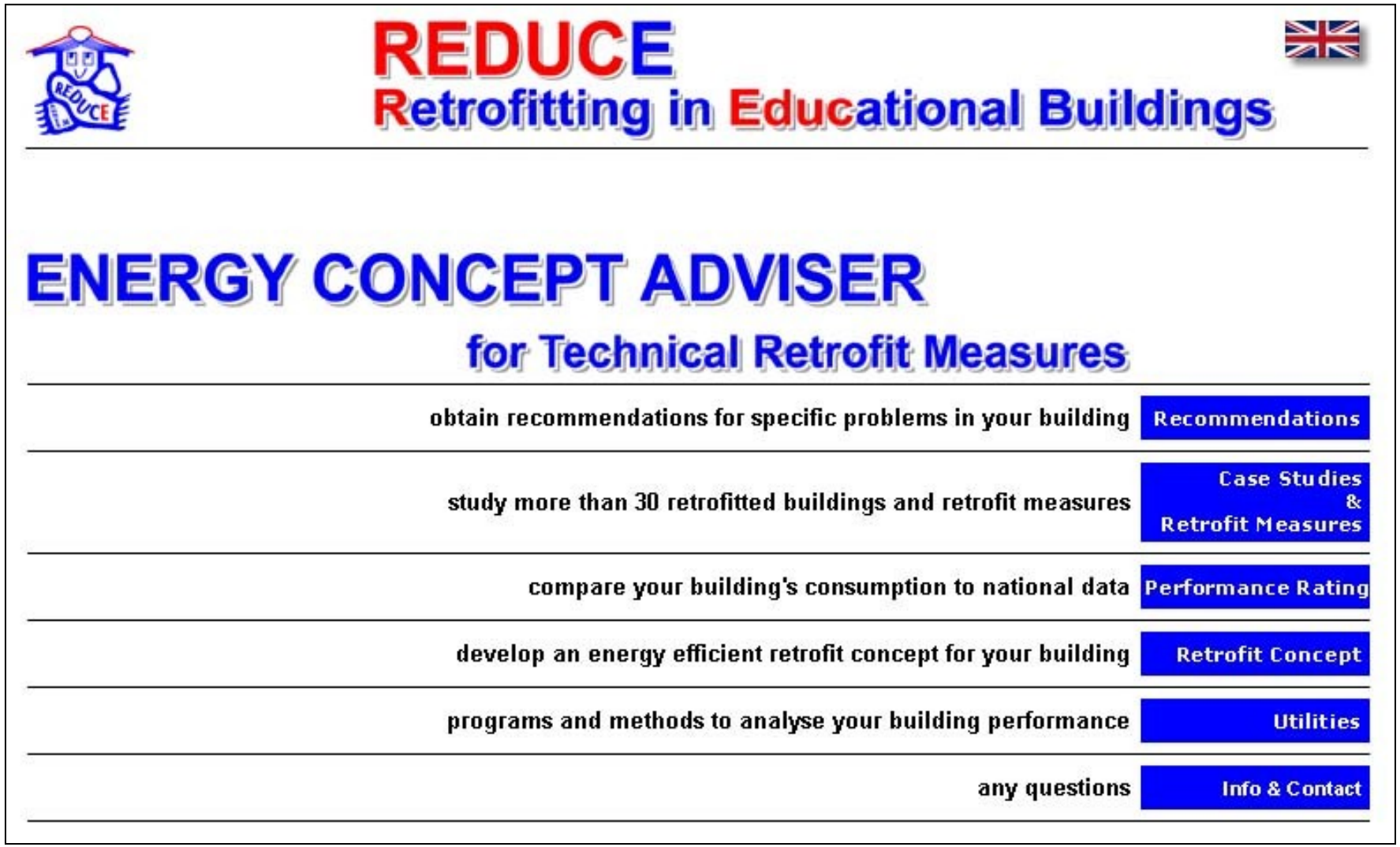
Annex 36: ECA - Navigation


REDUCE
Retrofitting in Educational Buildings
ENERGY CONCEPT ADVISER
for Technical Retrofit Measures
obtain recommendations for specific problems in your building
Recommendations
study more than 30 retrofitted buildings and retrofit measures
Case Studies & Retrofit Measures
compare your building's consumption to national data
Performance Rating
develop an energy efficient retrofit concept for your building
Retrofit Concept
programs and methods to analyse your building performance
Utilities
any questions
Info & Contact

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Annex 36: ECA – Matrix of case studies and retrofit measures

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Annex 36: ECA – Case study viewer

Home | Case Study Viewer | Exemplary Retrofitting of a School (EROS) in Stuttgart, Germany | Download of REPORT as PDF

- General Data
- Site, Typology
- Before Retrofit
- Retrofit Concept
- Energy Savings
- User Evaluation
- Renovation Costs
- Lessons Learned
- Additional Information

General Data

Address of project	Grund- und Hauptschule Plieningen Paracelsusstr. 4 70599 Stuttgart Germany
Year of construction	1936/1957/1970
Year of renovation	1996-1997
Total floor area	5260 m^2
Number of pupils	
Numer of classrooms	25 + 3 practical rooms
Typical classroom	60 m^2 20-25 pupils

South view of the school building

Project Summary

In the EROS Project the potential for the energy efficient retrofit of a typical school building in West Germany was demonstrated. The renewal of the space heating system was combined with improved insulation to yield synergetic effect. The project aimed to minimise future energy consumption and optimise the cost effectiveness of the retrofit.Thus, both operating costs and emissions were reduced. The goal was to improve the thermal insulation at least to the standard of the 1995 German regulations on thermal insulation for new buildings.

Retrofit features

- composite thermal insulation system, internal insulation
- low-E-coated glazings
- roof insulation with styrofoam done by teachers and students themselves
- replacement of the lighting system, daylight dependent artificial lighting control
- new gas boilers (condensing/low temperature boilers), new radiators

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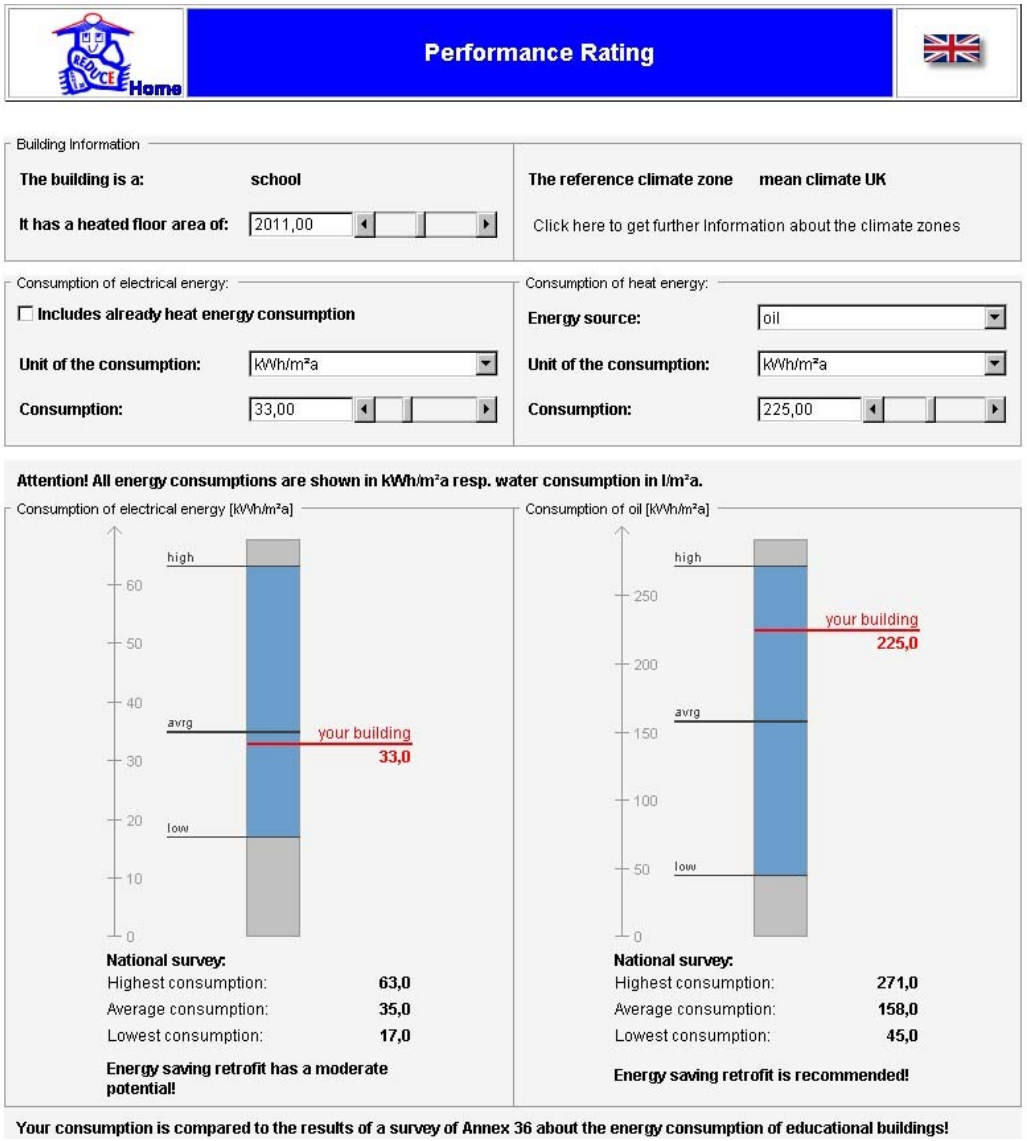
Annex 36: ECA – Performance rating



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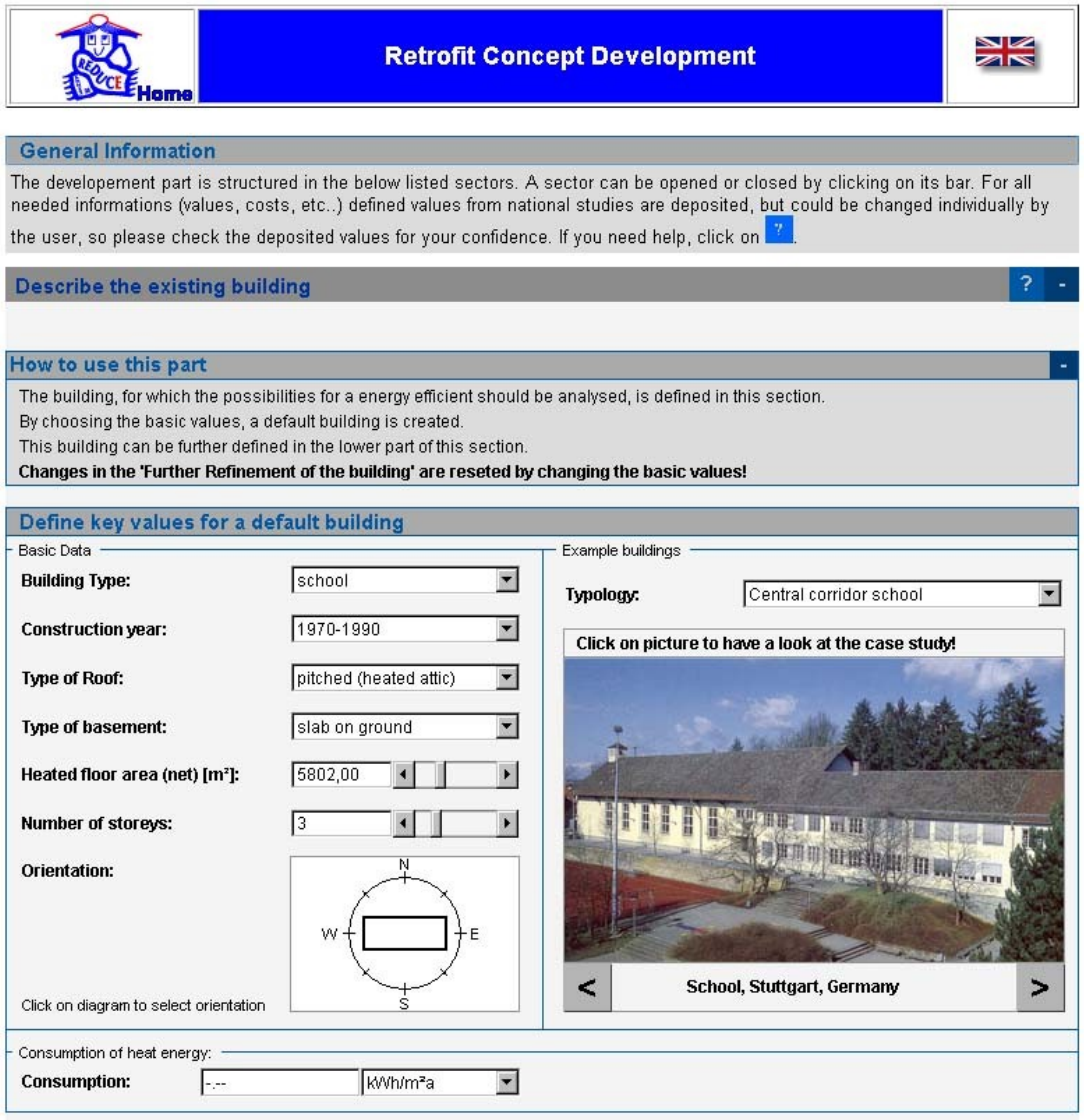
Annex 36: ECA – Retrofit concept development


Home
Retrofit Concept Development
General Information
The developement part is structured in the below listed sectors. A sector can be opened or closed by clicking on its bar. For all needed informations (values, costs, etc..) defined values from national studies are deposited, but could be changed individually by the user, so please check the deposited values for your confidence. If you need help, click on ?.
Describe the existing building
How to use this part
The building, for which the possibilities for a energy efficient should be analysed, is defined in this section.
By choosing the basic values, a default building is created.
This building can be further defined in the lower part of this section.
Changes in the 'Further Refinement of the building' are reseted by changing the basic values!
Define key values for a default building
Basic Data
Building Type: school
Construction year: 1970-1990
Type of Roof: pitched (heated attic)
Type of basement: slab on ground
Heated floor area (net) [m²]: 5802,00
Number of storeys: 3
Orientation:
N
W
E
S
Click on diagram to select orientation
Example buildings
Typology: Central corridor school
Click on picture to have a look at the case study!
School, Stuttgart, Germany
Consumption of heat energy:
Consumption: -.-- kWh/m²a

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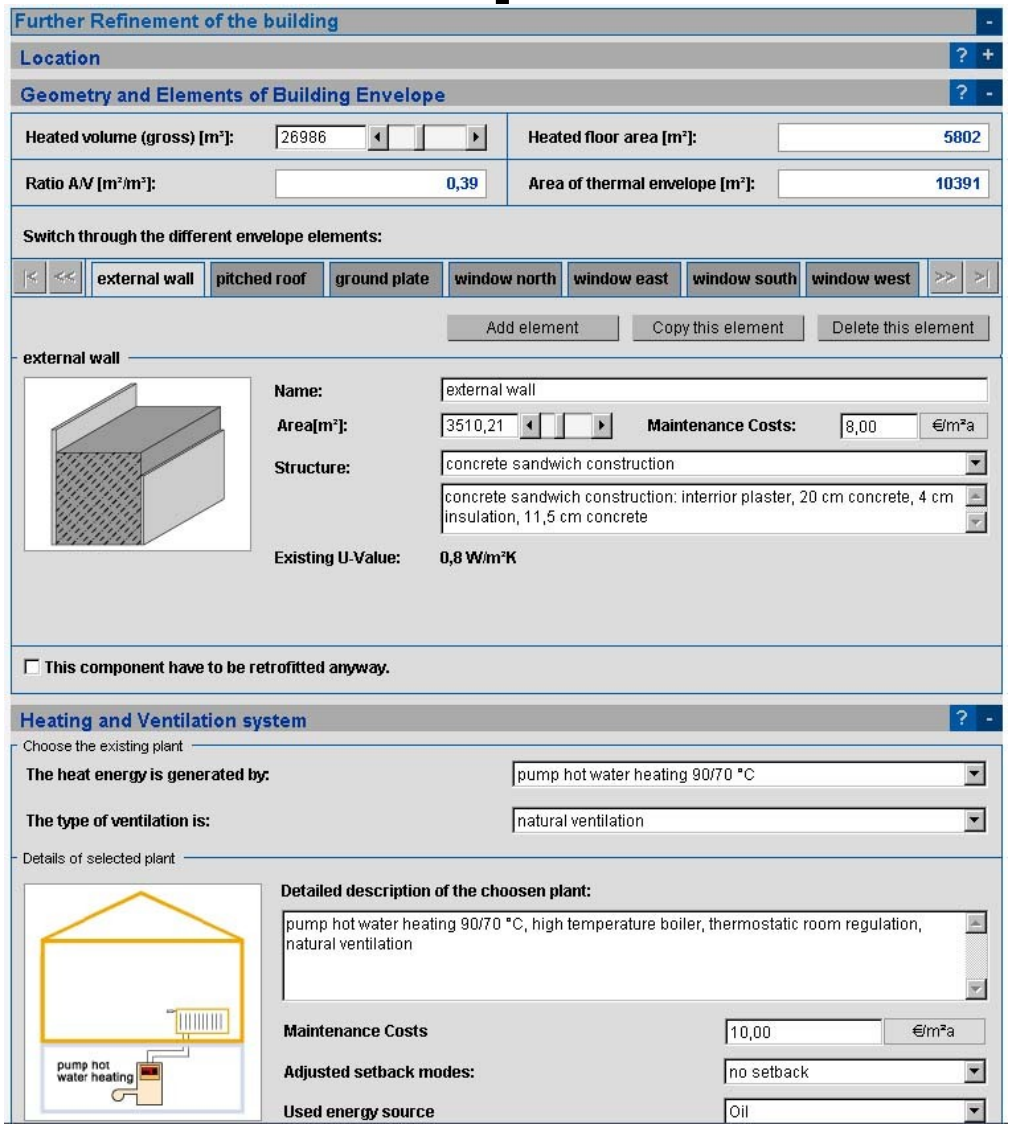
Further Refinement of the building
Location
Geometry and Elements of Building Envelope
Heated volume (gross) [m³]: 26986
Heated floor area [m²]: 5802
Ratio A/V [m²/m³]: 0,39
Area of thermal envelope [m²]: 10391
Switch through the different envelope elements:
external wall
pitched roof
ground plate
window north
window east
window south
window west
Add element
Copy this element
Delete this element
external wall
Name: external wall
Area[m²]: 3510,21
Maintenance Costs: 8,00 €/m²a
Structure: concrete sandwich construction
concrete sandwich construction: interrior plaster, 20 cm concrete, 4 cm insulation, 11,5 cm concrete
Existing U-Value: 0,8 W/m²K
This component have to be retrofitted anyway.
Heating and Ventilation system
Choose the existing plant
The heat energy is generated by: pump hot water heating 90/70 °C
The type of ventilation is: natural ventilation
Details of selected plant
pump hot water heating
Detailed description of the choosen plant:
pump hot water heating 90/70 °C, high temperature boiler, thermostatic room regulation, natural ventilation
Maintenance Costs 10,00 €/m²a
Adjusted setback modes: no setback
Used energy source Oil

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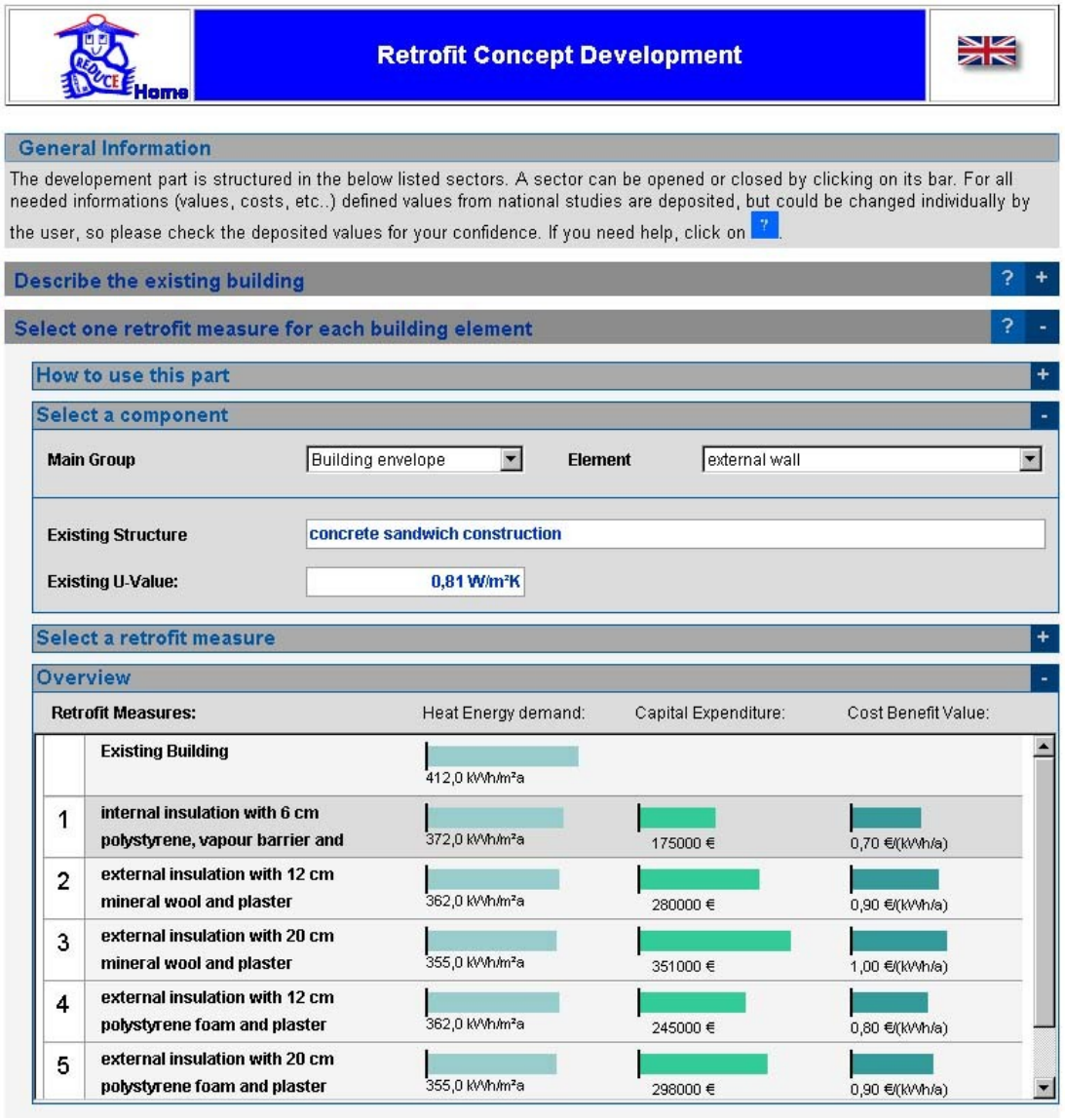
Home
Retrofit Concept Development
General Information
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Describe the existing building
Select one retrofit measure for each building element
How to use this part
Select a component
Main Group
Building envelope
Element
external wall
Existing Structure
concrete sandwich construction
Existing U-Value:
0,81 W/m²K
Select a retrofit measure
Overview
Retrofit Measures:
Heat Energy demand:
Capital Expenditure:
Cost Benefit Value:
Existing Building
412,0 kWh/m²a
1 internal insulation with 6 cm polystyrene, vapour barrier and
372,0 kWh/m²a
175000 €
0,70 €/(kWh/a)
2 external insulation with 12 cm mineral wool and plaster
362,0 kWh/m²a
280000 €
0,90 €/(kWh/a)
3 external insulation with 20 cm mineral wool and plaster
355,0 kWh/m²a
351000 €
1,00 €/(kWh/a)
4 external insulation with 12 cm polystyrene foam and plaster
362,0 kWh/m²a
245000 €
0,80 €/(kWh/a)
5 external insulation with 20 cm polystyrene foam and plaster
355,0 kWh/m²a
298000 €
0,90 €/(kWh/a)

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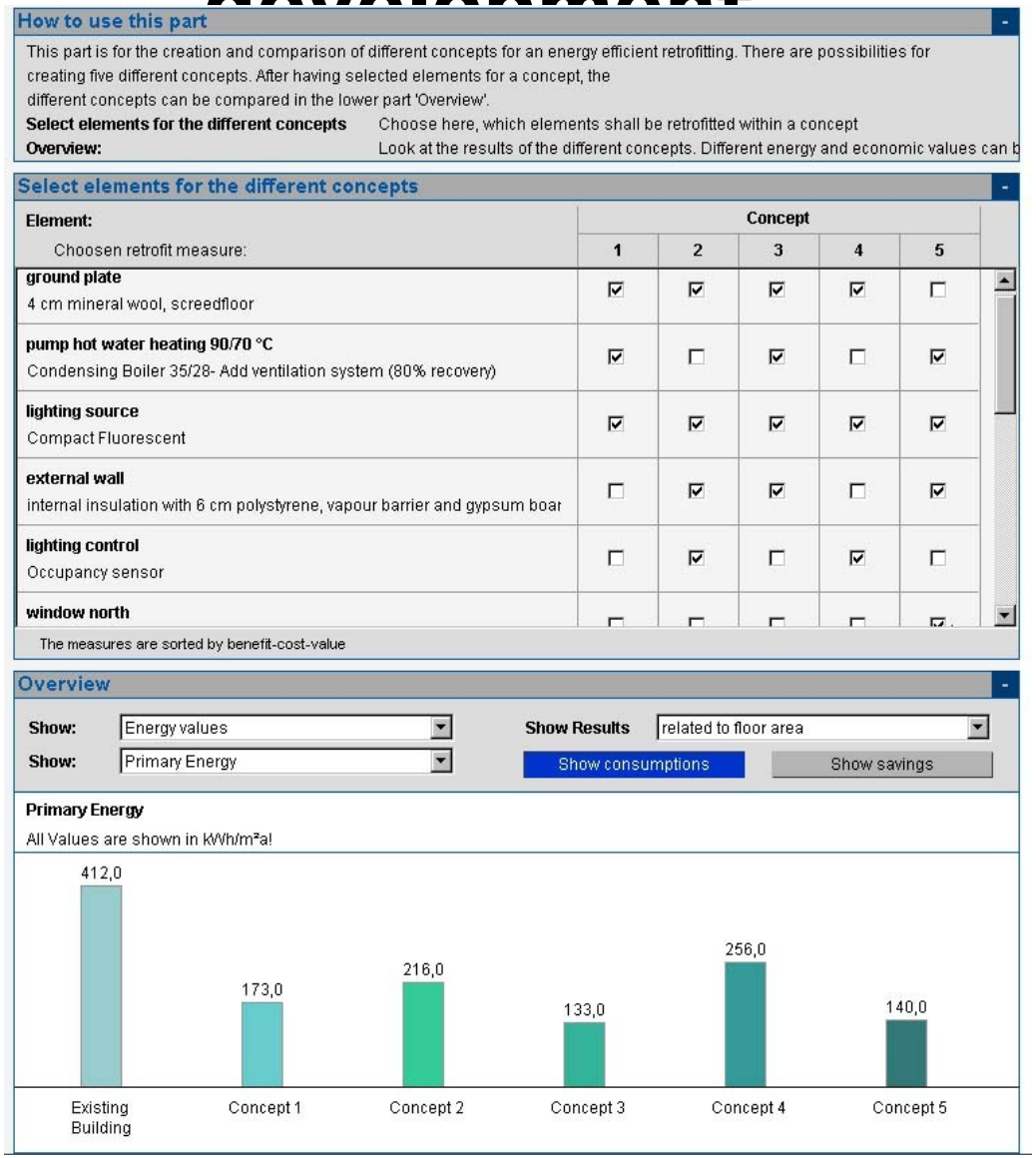

How to use this part

This part is for the creation and comparison of different concepts for an energy efficient retrofitting. There are possibilities for creating five different concepts. After having selected elements for a concept, the different concepts can be compared in the lower part 'Overview'.

Select elements for the different concepts Choose here, which elements shall be retrofitted within a concept

Overview: Look at the results of the different concepts. Different energy and economic values can b

Select elements for the different concepts

Element: / Choosen retrofit measure:	Concept 1	2	3	4	5
ground plate 4 cm mineral wool, screedfloor	☑	☑	☑	☑	☐
pump hot water heating 90/70 °C Condensing Boiler 35/28- Add ventilation system (80% recovery)	☑	☐	☑	☐	☑
lighting source Compact Fluorescent	☑	☑	☑	☑	☑
external wall internal insulation with 6 cm polystyrene, vapour barrier and gypsum boar	☐	☑	☑	☐	☑
lighting control Occupancy sensor	☐	☑	☐	☑	☐
window north	☐	☐	☐	☐	☑

The measures are sorted by benefit-cost-value

Overview

Show: Energy values — Show Results: related to floor area

Show: Primary Energy — Show consumptions | Show savings

Primary Energy

All Values are shown in kWh/m²a!

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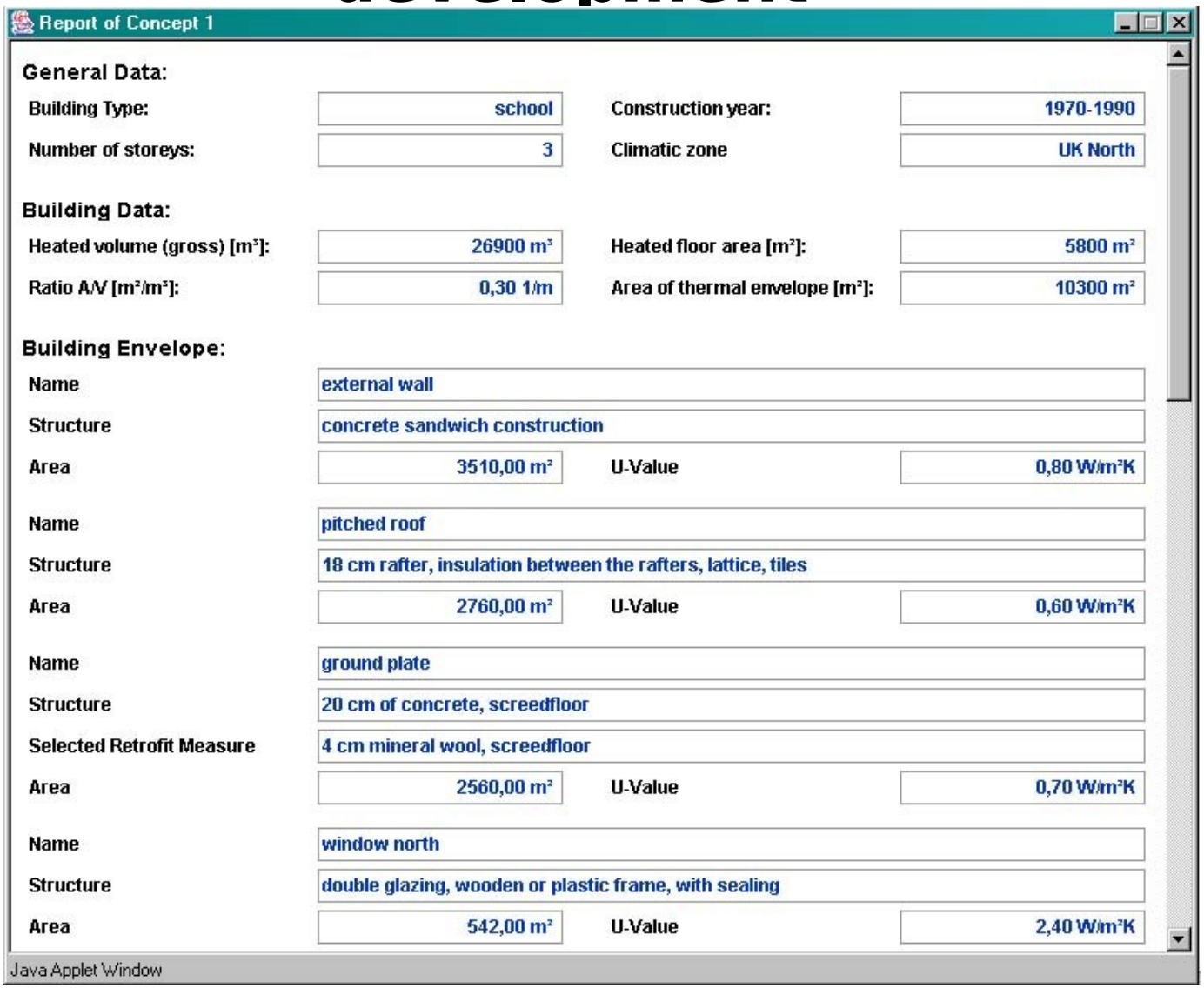
Annex 36: ECA – Retrofit concept development


Report of Concept 1
General Data:
Building Type: school
Construction year: 1970-1990
Number of storeys: 3
Climatic zone UK North
Building Data:
Heated volume (gross) [m³]: 26900 m³
Heated floor area [m²]: 5800 m²
Ratio A/V [m²/m³]: 0,30 1/m
Area of thermal envelope [m²]: 10300 m²
Building Envelope:
Name external wall
Structure concrete sandwich construction
Area 3510,00 m² U-Value 0,80 W/m²K
Name pitched roof
Structure 18 cm rafter, insulation between the rafters, lattice, tiles
Area 2760,00 m² U-Value 0,60 W/m²K
Name ground plate
Structure 20 cm of concrete, screedfloor
Selected Retrofit Measure 4 cm mineral wool, screedfloor
Area 2560,00 m² U-Value 0,70 W/m²K
Name window north
Structure double glazing, wooden or plastic frame, with sealing
Area 542,00 m² U-Value 2,40 W/m²K
Java Applet Window

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Annex 36: ECA – Where to get it?

- Internet:
  - http://www.annex36.com

- CD:
  - Fraunhofer Institute of Building Physics
    attn. Hans Erhorn
    Nobelstr. 12
    70569 Stuttgart
    Germany

- US representative:
  - Lorenz Schoff
    U.S. Department of Energy
    2906 Tall Oaks Dr.
    Blacksburg, VA 24060
    USA

EU 6th Framework Programme: IP BRITA in PuBs

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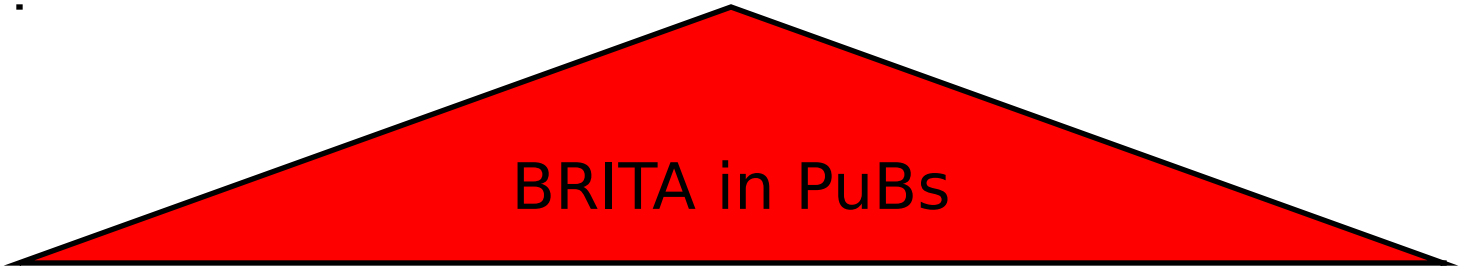

Exemplary retrofit of 9 demonstration buildings:

- college
- cultural centre
- nursery home
- student houses
- church
- library, etc.

Research work:

- real project planning needs and financing strategies
- design guidelines
- internet-based knowledge tool
- quality control tool-box

Dissemination:

- training of users and maintenance personnel
- publishing the work to different target groups by: > targeted PR-campaigns > local, national and internatio-nal networks > internet and other media

BRITA in PuBs: Covered Building Types

Region	Demonstration buildings	Habitation	Social facilities	Education and research	Cultural facilities	Services	Transport
Central	Nursery home Filderhof Stuttgart	X	X				mostly un-heated or heated with a lower temperature
	Educational College Plymouth			X			
North	Borgen Community Centre		X	X		X	
	Hol Church				X		
	Provehallen, Copenhagen				X		
South	Daniel's student hostel	X					
	Evonymos Library Athens				X	X	
East	Brewery University Brno	X	X			X	
	Main Building University Vilnius			X			

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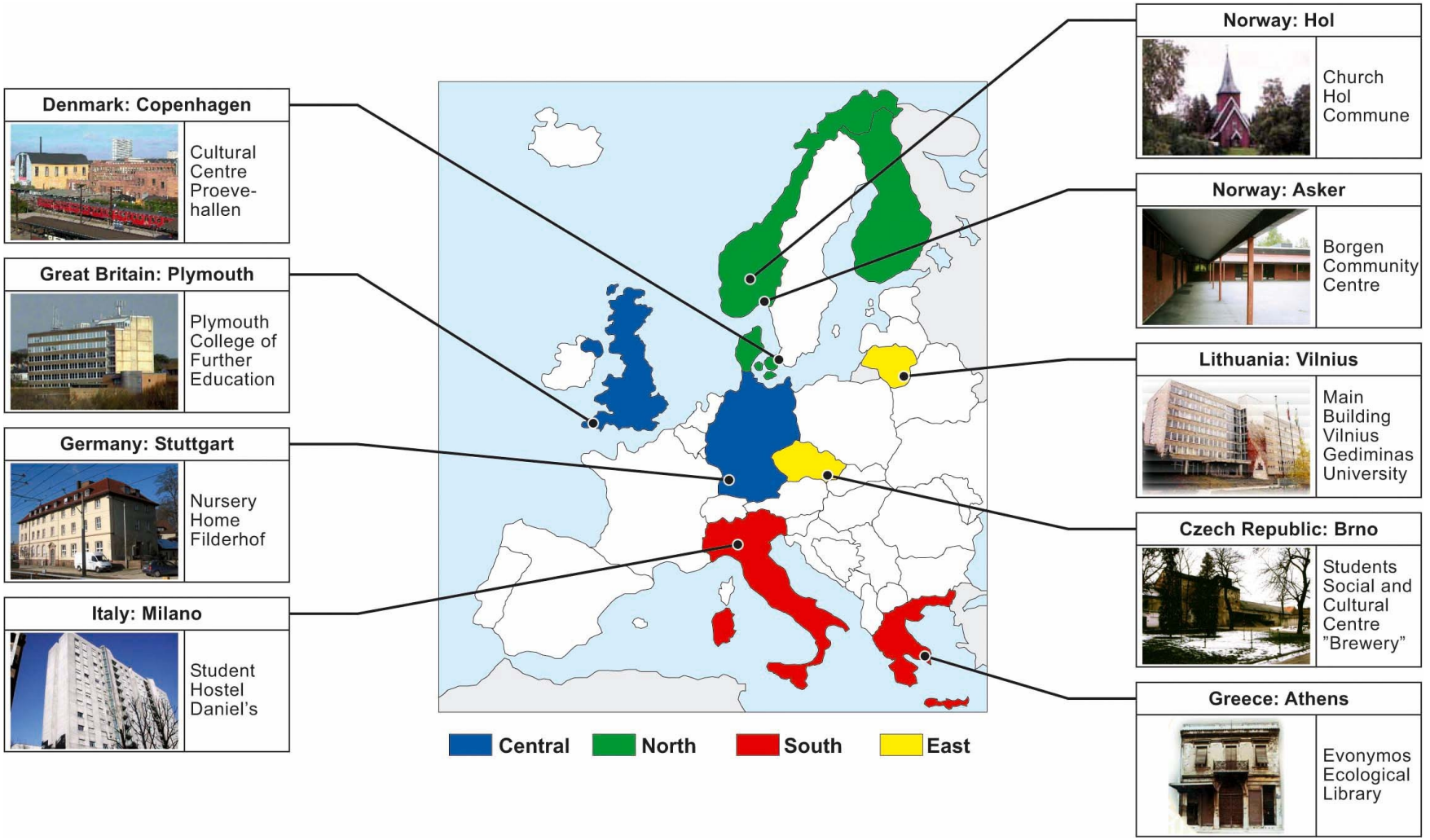
BRITA in PuBs: Participating countries and demonstration buildings



Workshop: Energy Efficiency in Government Building Retrofit

Heike Erhorn-Kluttig, Hans Erhorn
Fraunhofer Institute of Building Phys

rsery Home Filderhof, Stuttgart, Germany

Building owner	City of Stuttgart
Address	Filderhof, Filderstr. 1, D-70563 Stuttgart
Type	Nursery home for people with dementia
Age	1890, extension in 1952
Fl	2875 m², after retrofit 2131 m²
	4
project	2004
d of project	2006 plus 2 years monitoring

18000 comparable buildings in Europe

Summary: y will be renovated and enlarged by an extension and an atrium. Other torn down. Because of the very high energy consumption in relation to uilding stock a new heating plant and an improved building envelope alised.

Measures high-efficient windows, insulation incl. light wedges, hybrid ventilation, high-efficien artificial lighting, invest. on vacuum interior insulation
solar thermal collectors for DHW, atria for passive solar gains, daylighting transfer, invest. on PV-integration and solar chimney
combined heat and power unit incl. waste gas heat exchanger, condensing boiler for peak load
single-room control, demand control of artificial lighting, long-term monitoring with SEKS

Energy and water use	Measured 2001	nat. benchmarks
Space heating	248 kWh/m²a	200 kWh/m²a
Electricity	40.8 kWh/m²a	50 kWh/m²a
Water	2.05 m²/m²a	1.14 m³/m²a

planned heating savings	191 kWh/m²a
planned electricity savings	55 kWh/m²a*
estimated elig. building costs	760800 €
total pay-back period	20.5 years

* partly fed to local supplier

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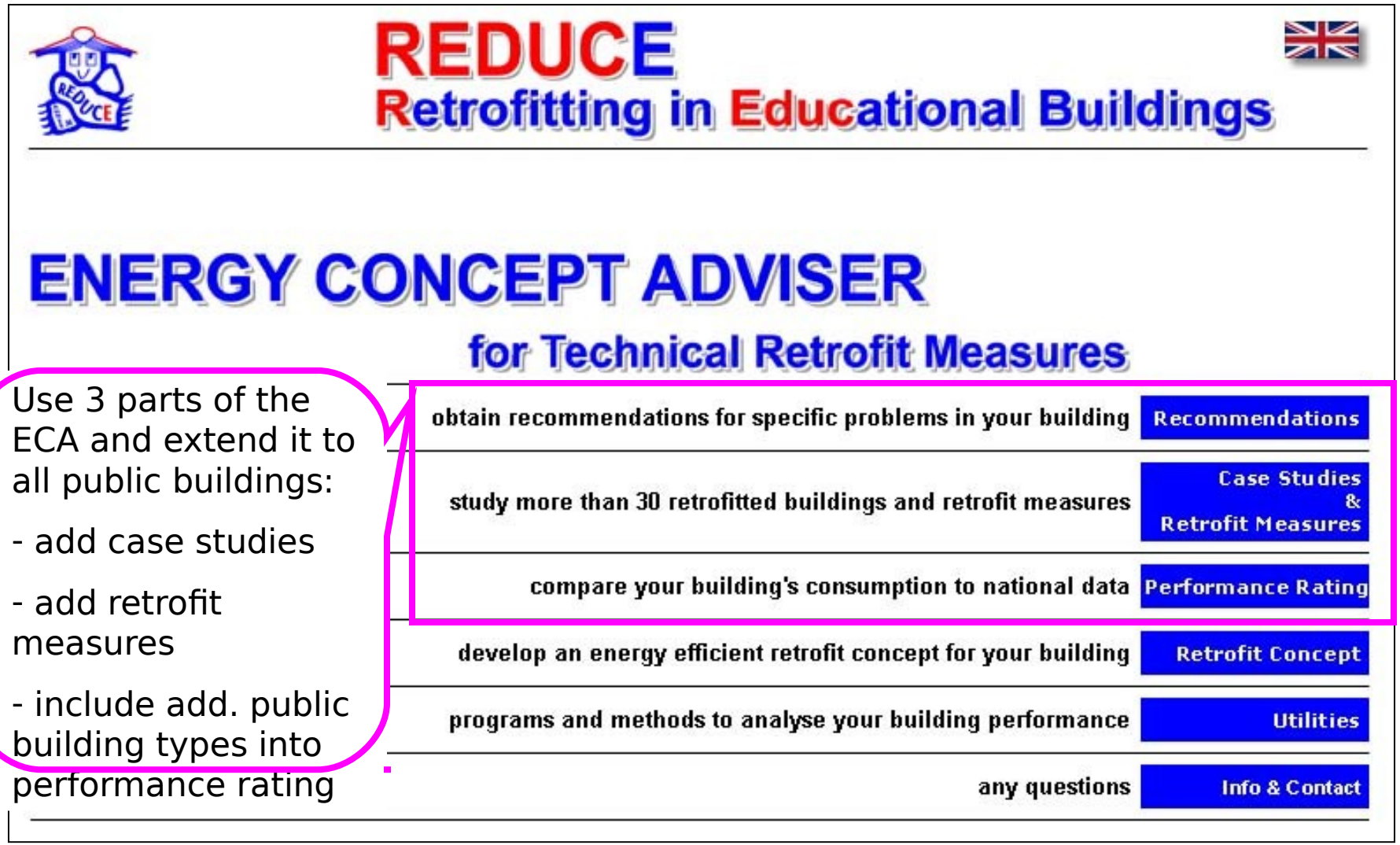
Research Work Package: BRITA Information Tool


REDUCE
Retrofitting in Educational Buildings
ENERGY CONCEPT ADVISER
for Technical Retrofit Measures
obtain recommendations for specific problems in your building
Recommendations
study more than 30 retrofitted buildings and retrofit measures
Case Studies & Retrofit Measures
compare your building's consumption to national data
Performance Rating
develop an energy efficient retrofit concept for your building
Retrofit Concept
programs and methods to analyse your building performance
Utilities
any questions
Info & Contact

Use 3 parts of the ECA and extend it to all public buildings:

- add case studies
- add retrofit measures
- include add. public building types into performance rating

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EU Programmes: Projects simplifying the implementation of the EPBD in the member states through information exchange, tool development, etc.

1. **Energy Performance Assessment of Non-Residential Buildings (EPA-NR)**
   - benefit from experiences in the MS by exchanging knowledge and ideas
   - provide a method and instruments (including software) and test and show the functioning in practice
   Target Groups: End users = Consultants applying the method, policy makers
   Range of Application: Non-residential buildings (energy use not dominated by production processes)
   pilot studies: offices, educational buildings, health care buildings
2. **Applying the EPBD to improve the ENergy PERformance requirements to EXISTing buildings (ENPER EXIST)**
   WP1: Tools application: identify the gaps between CEN standards, national documents and practice for existing building and provide recommendations for improvements.
   WP2: Legal, economical and organisational impact: study and analyse the non technical issues related to the application of certification and regulation of existing building processes in the Member States and mainly the financial, educational and administrative aspects
   WP3: Building stock knowledge
   WP4: Roadmap: to define a roadmap for actions going beyond the limits of EPBD

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EU Programmes: Projects simplifying the implementation of the EPBD in the member states through information exchange, tool development, etc.

3. EU Concerted Actions

Forum to avoid redundancy of efforts for the harmonious transposition of the EPBD and
for stimulating MS policies towards a convergence of their approaches
25 countries
Members from policy and research/practice
Activity areas:
1. Certification procedures;
2. Inspection of boilers and air-conditioning systems;
3. Specifications and training requirements for experts and inspectors;
4. Procedural aspects for energy performance characterisation.

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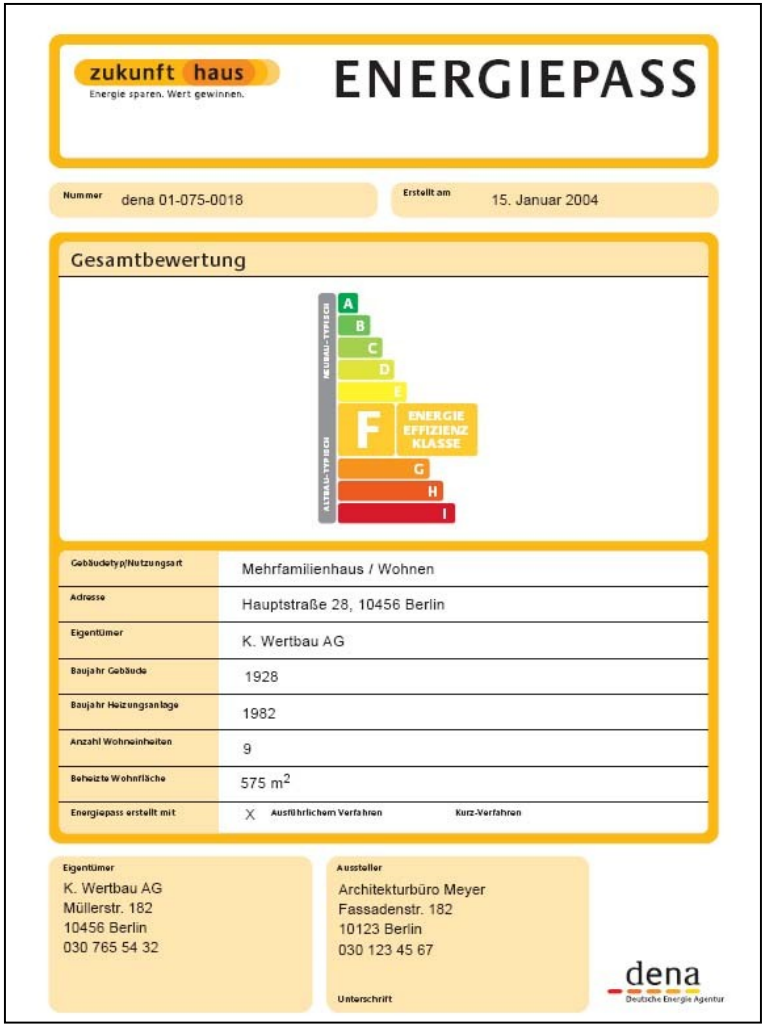
German field study on the certification of existing dwellings

- about 5000 dwellings were certified during the field study
- certification done by a case study visit and a calculation done by using computer programs
- evaluation of the field study completed
- cost per certification ~ 250 €
- simplified standardised data acquisition necessary (inspection protocoll)
- classification or using a scale label not yet decided
- asset rating in Germany (not operational rating)
- certification includes proposals for improvement of the energy performance



zukunft haus
Energie sparen. Wert gewinnen.

ENERGIEPASS

Nummer: dena 01-075-0018
Erstellt am: 15. Januar 2004

Gesamtbewertung

NEUBAU-TYPISCH
A
B
C
D
E
F ENERGIE EFFIZIENZ KLASSE
G
H
I
ALTBAU-TYPISCH

Gebäudetyp/Nutzungsart	Mehrfamilienhaus / Wohnen
Adresse	Hauptstraße 28, 10456 Berlin
Eigentümer	K. Wertbau AG
Baujahr Gebäude	1928
Baujahr Heizungsanlage	1982
Anzahl Wohneinheiten	9
Beheizte Wohnfläche	575 m^2
Energiepass erstellt mit	X Ausführlichem Verfahren Kurz-Verfahren

Eigentümer
K. Wertbau AG
Müllerstr. 182
10456 Berlin
030 765 54 32

Aussteller
Architekturbüro Meyer
Fassadenstr. 182
10123 Berlin
030 123 45 67

Unterschrift

dena
Deutsche Energie Agentur

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Fraunhofer IBP Institut Bauphysik

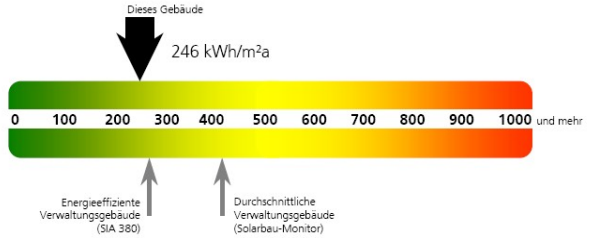
First Certifications on Non-Residential Buildings: Office building in Munich

Fraunhofer Institut Bauphysik

ENERGIEPASS

Projektbezeichnung	Energiepass Münchner Tor
Erstellt am	4. November 2004

Gesamtbewertung Primärenergiebedarf

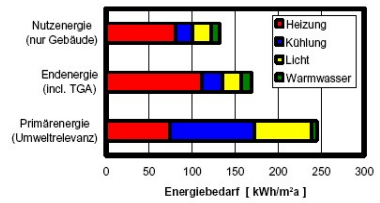

Dieses Gebäude
246 kWh/m²a
0 100 200 300 400 500 600 700 800 900 1000 und mehr
Energieeffiziente Verwaltungsgebäude (SIA 380)
Durchschnittliche Verwaltungsgebäude (Solarbau-Monitor)

Gebäudetyp/Nutzungsart	Bürogebäude
Adresse	Schlüterstrasse 6-10, 80805 München
Eigentümer	Münchener Rückversicherungsges.
Baujahr Gebäude	2003
Baujahr Anlagentechnik	2003
Bruttogrundfläche	49.258 m²
Energiepaß erstellt mit	DIN V 18599

Eigentümer
Münchener Rückversicherungs-Gesellschaft AG
Königinstr. 107
80802 München

Aussteller
Fraunhofer-Institut für Bauphysik
Nobelstr. 12
70569 Stuttgart

Detailanalyse



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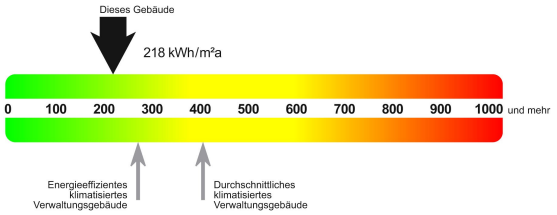
Fraunhofer Institut Bauphysik

First Certifications on Non-Residential Buildings: Berlaymont Building (Seat of the EU Commission)

ENERGIEPASS

Projektbezeichnung	EU-Kommissions-Gebäude Berlaymont
Erstellt am	16. Dezember 2004

Gesamtbewertung Primärenergiebedarf

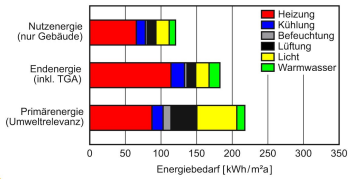

Dieses Gebäude
218 kWh/m²a
0 100 200 300 400 500 600 700 800 900 1000 und mehr
Energieeffizientes klimatisiertes Verwaltungsgebäude
Durchschnittliches klimatisiertes Verwaltungsgebäude

Gebäudetyp / Nutzungsart	klimatisiertes Verwaltungsgebäude
Adresse	Rue de la Loi, B-1040 Brüssel
Nutzer	Europäische Union
Baujahr Gebäude	1967 / 2004
Baujahr Anlagentechnik	2004
Nettogrundfläche	170.721 m²
Energiepass erstellt mit	DIN V 18599

Nutzer
Europäische Union
Rue de la Loi
B-1049 Brüssel

Aussteller
Fraunhofer-Institut für Bauphysik
Nobelstraße 12
D-70569 Stuttgart

Detailanalyse



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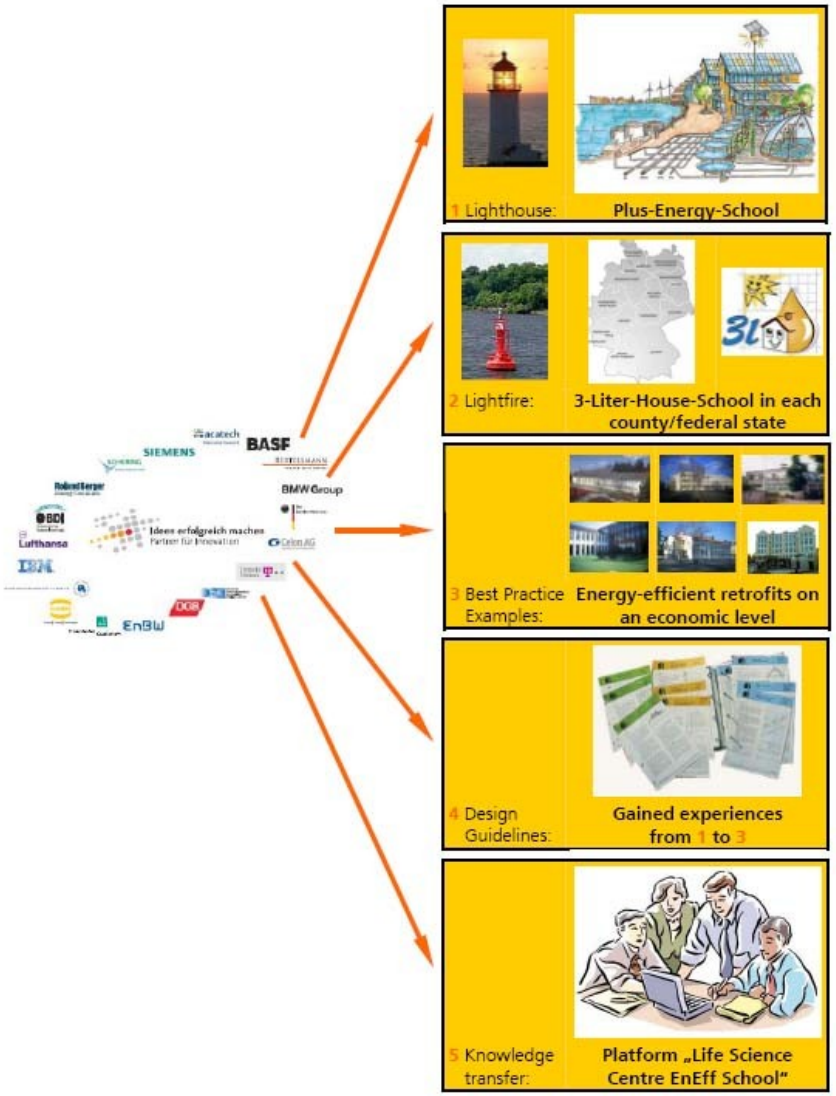
Innovation offensive of the German chancellor: Innovation idea „Energy-efficient retrofit of schools“



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INTERNATIONAL ENERGY AGENCY

Energy Conservation in Buildings & Community Systems Programme

Annex 46: Holistic Assessment Tool-kit on Energy Retrofit Measures for Governmental Buildings - EnERGo

EnERGo

Subtask A
Develop an energy assessment and analysis methodology/protocol and a tool „Energy Assessment Guide for Energy Managers and ESCOs“

Subtask B
Develop a database of “Energy Saving Technologies and Measures for Government Building Retrofits” with examples of best practice

Subtask C
Develop “Best-practice Guidelines for innovative Energy Performance Contracts”

Integrating Subtask D:

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